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CLAIMS 1-47 (CANCEL)

48. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a display with low brightness by said liquid crystal display panel is performed using a low reflectance characteristic of said solar battery.

49. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a film having substantially same spectral reflectance as that of a power generation portion of said solar battery is provided on the visual recognition side of an electrode portion of said solar battery.

50. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a printed layer film having substantially same spectral reflectance as that of a power generation portion of said solar battery is provided on non-power-generation portions of said solar battery.

51. The timepiece according to claim 48, wherein

a film for changing a color of said solar battery is provided between said solar battery and said liquid crystal display panel.

52. The timepiece according to claim 48, wherein

a power generation quantity adjustment region for changing a transmittance is provided at a part of a display region of said liquid crystal display panel to adjust a quantity of power generation of said solar battery.

53. The timepiece according to claim 48, wherein

means for conducting a control to increase a transmittance of said liquid crystal display panel is provided to increase a quantity of power generation of said solar battery while said liquid crystal display panel is in a non-driving display state.

54. The timepiece according to claim 48, wherein

a display is performed by a change in color of said liquid crystal display panel and a spectral reflection characteristic of said solar battery.

55. The timepiece according to claim 48, wherein

a display is performed by a change in color of said liquid crystal display panel and a spectral reflection characteristic of said film.

56. The timepiece according to claim 48, wherein

a liquid crystal layer of said liquid crystal display panel is a mixed liquid crystal layer made by mixing a dichroic dye in a liquid crystal.

57. The timepiece according to claim 48, wherein

a liquid crystal layer of said liquid crystal display panel is a mixed liquid crystal layer containing a polymer in a liquid crystal.

58. The timepiece according to claim 48, wherein

a liquid crystal layer of said liquid crystal display panel is a twisted nematic liquid crystal layer or a super twisted nematic liquid crystal layer, polarizing films are provided on the visual recognition side and on the opposite side thereto respectively with said liquid crystal layer interposed therebetween, and said polarizing film provided on the opposite side to the visual recognition side is a reflection-type polarizing film of which one polarization axis is a transmission axis and another polarization axis substantially parpendicular thereto is a reflection axis.

59. The timepiece according to claim 48, wherein

a liquid crystal layer of said liquid crystal display panel is a twisted nematic liquid crystal layer or a super twisted nematic liquid crystal layer, and a polarizing film is provided on the visual recognition side and a cholesteric liquid crystal film is provided on the opposite side thereto respectively with said liquid crystal layer interposed therebetween.

60. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, said solar battery has a

plurality of transmission regions for transmitting light and a plurality of power generation regions for absorbing light to generate electric power, and

said power generation region of said solar battery is provided at a position corresponding to a non-display region around a display pixel portion of said liquid crystal display panel, and said transmission region is provided at a position corresponding to said pixel portion of said liquid crystal display panel.

61. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, said solar battery has a plurality of transmission regions for transmitting light and a plurality of power generation regions for absorbing light to generate electric power, and

said power generation region of said solar battery is provided at a position corresponding to at least a panel cover portion around a display region of said liquid crystal display panel, and said transmission region is provided at a position corresponding to an inside of said display region of said liquid crystal display panel.

62. The timepiece according to claim 60, wherein

an auxiliary light source is provided on a side of a surface opposite to a surface facing said liquid crystal display panel of said solar battery to allow light to be applied from said auxiliary light source through said transmission region of said solar battery to said liquid crystal display panel.

63. The timepiece according to claim 61, wherein

an auxiliary light source is provided on a side of a surface opposite to a surface facing said liquid crystal display panel of said solar battery to allow light to be applied from said auxiliary light source through said transmission region of said solar battery to said liquid crystal display panel.

64. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

a solar battery unit is provided on a visual recognition side of said liquid crystal display panel so that at least a part of said solar battery unit overlaps said liquid crystal display panel, said solar battery unit has a plurality of power generation portions and a plurality of transmission portions respectively provided between adjoining power generation portions, a width of said transmission portions is larger than that of said power generation portions, and

a display by said liquid crystal display panel is performed through said plurality of transmission portions of the solar battery unit.

65. The timepiece according to claim 64, wherein

a printed layer for cover is provided at a part of the visual recognition side of said solar battery unit.

66. The timepiece according to claim 64, wherein

said liquid crystal display panel has, from said solar battery side, a first transparent substrate, a liquid crystal layer and a second transparent substrate, and said liquid crystal layer is a mixed liquid crystal layer composed of a liquid crystal and a transparent solid substance.

67. The timepiece according to claim 66, wherein a reflector is provided on an opposite side to said solar battery unit with respect to said liquid crystal display panel.

68. The timepiece according to claim 66, wherein

a reflector is provided on an opposite side to said solar battery unit with respect to said liquid crystal display panel, and

an auxiliary light source is provided on said first substrate side of said liquid crystal display panel.

69. The timepiece according to claim 64, wherein

an area ratio between said transmission portion and said power generation portion of said solar battery unit is different depending on a place of said liquid crystal display panel which said solar battery unit overlaps.

70. The timepiece according to claim 64, wherein

said solar battery unit has a transparent substrate, and said transparent substrate has a scattering property within a region where said transparent substrate overlaps a portion of said liquid crystal display panel except for a display region

71. The timepiece according to claim 64, wherein

a light guide portion for guiding light of an external light source to a display region of said liquid crystal display panel is provided at an outer peripheral portion of said solar battery unit.

72. The timepiece according to claim 64, wherein

a ratio of an area of said transmission portion with respect to a total area of the area of said transmission portion and an area of said power generation portion of said solar battery unit is 30% or more, and a width of said power generation portion is 100 micrometers (μm) or less.

73. The timepiece according to claim 64, wherein

light-shielding to said liquid crystal display panel by said power generation portion of said solar battery unit is 20% or less of pixel portions of said liquid crystal display panel.

74. The timepiece according to claim 72, wherein

said power generation portion and said transmission portion are regularly arranged in stripes or in concentric circles.

75. The timepiece according to claim 68, wherein

a circuit board connected to said solar battery unit and said auxiliary light source is provided, and

a connection between said solar battery unit and said circuit board and a connection between said auxiliary light source and said circuit board are established through an integrated connecting medium composed of the same material.

76. The timepiece according to claim 66, wherein

an ultraviolet cut layer for preventing deterioration of said liquid crystal display panel is provided on the visual recognition side of said solar battery unit.

77. The timepiece according to claim 64, wherein

a wavelength conversion layer for converting light with a wavelength less than 400 nanometers (nm) to light with a wavelength of 400 nanometers (nm) or greater is provided on the visual recognition side of said solar battery unit.

78. The timepiece according to claim 64, wherein

a wavelength conversion layer for converting light with a wavelength less than 400 nanometers (nm) to light with a wavelength of 400 nanometers (nm) or greater is provided on the visual recognition side of said solar battery unit, and an ultraviolet light cut layer for blocking the light with a wavelength less than 400 nanometers (nm) is provided between said wavelength conversion layer and said solar battery unit.

79. The timepiece according to claim 64, wherein

at least a part of a substrate of said solar battery unit or a cover glass of said timepiece is a wavelength conversion layer for converting light with a wavelength less than 400 nanometers (nm) to light with a wavelength of 400 nanometers (nm) or greater.

80. The timepiece according to claim 64, wherein

a hand for indicating time is provided, and said solar battery unit is provided with a through hole into which a shaft of said hand is inserted.

81. The timepiece according to claim 64, wherein

a hand for indicating time is provided, said solar battery unit and said liquid crystal display panel are respectively provided with a through hole for threading a shaft of said hand therethrough at a position corresponding to a portion where they overlap one upon another, and a resin portion for preventing breakage is provided at least on an inner peripheral surface of said through hole of a substrate of said solar battery unit.

82. The timepiece according to claim 80, wherein

a resin portion for preventing breakage is provided at least on an inner peripheral surface of said through hole of a substrate of said solar battery unit.

83. The timepiece according to claim 64, wherein

an auxiliary light source is provided on an opposite side to the visual recognition side of said liquid crystal display panel.

84. The timepiece according to claim 64, wherein

a plurality of solar battery units using light with different wavelengths at power generation portions thereof are provided in laminated layers.

85. The timepiece according to claim 64, wherein

a solar battery unit is also provided on an opposite side to the visual recognition side of said liquid crystal display panel.

86. A timepiece provided with a liquid crystal display panel for displaying thereon at least one of time information and calendar information, wherein

said liquid crystal display panel has a liquid crystal layer coupled by a pair of transparent substrates and has a nonlinear resistance element on one of said substrates for switching a signal to a pixel portion, and

a power generation portion of a solar battery is provided on said one substrate of said liquid crystal display panel, and semiconductor layers of said power generation portion and said nonlinear resistance element are formed of same semiconductor.

87. The timepiece according to claim 86, wherein

said power generation portion of said solar battery is provided directly on said one transparent substrate of said liquid crystal display panel.

88. The timepiece according to claim 86, wherein

said liquid crystal display panel has a liquid crystal layer sandwiched by a pair of transparent substrates, and at least said substrate on said solar battery side out of said pair of substrates is made of an organic material.

89. The timepiece according to claim 86, wherein

said power generation portion and said transmission portion of said solar battery unit are regularly arranged in stripes, and a pitch between adjacent power generation portions of said solar battery unit and a pitch between adjacent pixel portions of said liquid crystal display panel are substantially same.

90. The timepiece according to claim 86, wherein

said liquid crystal display panel becomes any one of a scattering state, a transmission state and a reflection state when no voltage is applied thereto.

91. The timepiece according to claim 86, wherein

said power generation portion of said solar battery unit has a structure of sandwiching a semiconductor layer between two electrodes, and either of said two electrodes is made of a transparent conductive film.

92. A liquid crystal display device wherein a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a display with low brightness by said liquid crystal display panel is performed using a low reflectance characteristic of said solar battery.

93. A liquid crystal display device wherein a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a film having substantially same spectral reflectance as that of a power generation portion of said solar battery is provided on the visual recognition side of an electrode portion of said solar battery.

94. A liquid crystal display device wherein a solar battery is provided to face at least a part of a surface opposite to a visual recognition side of said liquid crystal display panel, light is applied to said solar battery through a transmission portion of said liquid crystal display panel to generate electric power, and a printed layer having substantially same spectral reflectance as that of a power generation portion of said solar battery is provided on non-power-generation portions of said solar battery.